

ABSTRACT

The present invention relates to adsorption and regeneration of adsorbent media for air pollution control, volatile organic compound (VOC) control, hazardous air pollutant (HAP) control, toxic air contaminant (TAC) control, and solvent recovery. The present invention is an improved device for removing VOCs/HAPs/TACs from high volume air streams to ultra-low levels using synthetic polymeric adsorbents. The invention is embodied in a HAP adsorption section, a regeneration section, and a chemical destruction or recovery section. In order to recover HAPs from low concentration air streams, multiple adsorption (concentration) steps may be necessary. Adsorption is typically accomplished with a multi-tray fluidized bed operating in the moving bed to fully fluidized regime. The regeneration section has either a long, multi-stage regeneration column with a high number of stages relative to the number of theoretical desorption stages required or a recirculating fluidized bed with a high make-up air to volume ratio. Destruction can be carried out through a thermal or catalytic oxidizer or the regeneration air stream can be concentrated into fixed-bed carbon vessels.

REFERENCES

2,413,771	6/1943 Luaces et al.
2,413,771	1/1947 Luaces. Adsorption Apparatus.
2,428,885 Adsorption	10/1947 Luaces et al. Method of Ventilation Including the Removal of Solvent Vapor by
2,519,296	8/1950 Simpson et al. Apparatus for Conditioning Gases
3,944,402	3/1976 Cheremisinoff. – Air Pollution Control Apparatus and Process. Liquid contactor,
3,945,811	3/1976 Beasley et al. Process for Removing Sulfur Compounds from Gases.
4,039,290	8/1977 Inada et al. Spent Activated Carbon Regenerator
4,312,640	1/1982 Verrando et al. Heat-Reactivatable Adsorbent Gas Fractionator and Process
4,338,102 to particulates	7/1982 Otsuka et al – Device for Removing Radioactive Particles in Moist Gas – Applies
4,820,455 Column.	4/1989 Kunesh et al. Apparatus for Redistribution of Vapor and Liquid in a Packed
4,956,095	9/1990 Robeson et al. Water or Gas Purification by Bulk Adsorption
5,273,572	12/1993 Baker et al. Process for Removing an Organic Compound from Water
5,387,377	2/1995 Chuang. Active liquid Distributor Containing Packed Column.
5,399,267	3/1995 Wang et al. Liquid Treatment System with Air Emission Control
5,509,956	4/1996 Opperman et al. Regenerative Apparatus for Recovery of Volatiles
5,595,586	1/1997 Sivavec. Method for Recovery of Volatile Organic Compounds.
5,676,738	10/1997 Cioffi et al. – Same as 5,904,750 but earlier – Differences are mainly in what to do with the regenerant gas.

**Patent Application of Matthew L. McCullough for
“Method for Achieving Ultra-Low Emission Limits in VOC/HAP/TAC Control”**

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5,772,734 6/1998 Baker et al. – Membrane Hybrid Process for Treating Low Organic Concentration Gas Streams.

5,797,979 8/1998 Quinn. Removal of Acid Gases from Gas Mixtures Using Ion Exchange Resins

5,814,132 9/1998 Grime et al. Method for VOC abatement and paint spray booth incorporating such method.

5,904,750 9/1999 Cowles. Method for VOC Abatement.**?

5,968,235 10/1999 Grime et al. Method for VOC Abatement

6,423,235B1 7/2002 Shimoji et al. Column Gas-Liquid Contacting Apparatus and its use thereof.

Chemical Properties Handbook, Carl L. Yaws, Editor, McGraw Hill, New York, 1999.